Publication No. 79-e24

STATE OF WASHINGTON

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Governor

DEPARTMENT OF ECOLOGY
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M E M O R A N D U M

TO: John Hodgson

FROM: Harold Porath

SUBJECT: Omak STP Class II Inspection

DATE: November 29, 1979

Introduction

A Class II inspection was conducted at the Omak Sewage Treatment Plant (STP) on September 18-19, 1979. In attendance were Wes Maier (DOE Operator- Trainer), Curley Wilson (Omak STP Operator), and Harold Porath (DOE-Central). Composite and grab samples were collected, split with the operator, and shipped to the DOE laboratory in Tumwater for analysis. In addition, laboratory procedures currently being used by the operator were reviewed for accuracy and compliance with DOE methods.

The Omak sewage treatment facility consists of a lift station, headworks (with two communitors and a bar screen), oxidation ditch, two secondary clarifiers, a screw type sludge return pump, a constant speed sludge waste pump, an aerobic digester, sludge drying beds, pressure filters, two chlorine contact chambers, and an effluent outfall. Influent sewage from the Town of Omak enters the lift station, and is lifted up to the headworks where the sewage is ground up into smaller pieces by the communitors (or else screened by the bar screen if the communitors are out of service, or if the flow is such that it cannot be entirely accommodated by the communitors). From the headworks, the sewage flows via gravity to the oxidation ditch which has a residence time of 33 hours at the present flow (0.68 MGD). The sewage then flows to the secondary clarifier(s) with the effluent then flowing to the chlorine contact chamber for disinfection, and then via the outfall to the Okanogan River, waterway segment No. 22-49-02. Sludge settled in the secondary clarifier(s) is either returned to the oxidation ditch via the telescopic valves and return sludge screw pump, or wasted to either the aerobic digester or sludge drying beds via the telescopic valves and waste sludge pump. At times of high groundwater infiltration, the effluent from the secondary clarifier(s) flows through the pressure filters (in order to achieve 85% removal of BOD and Suspended Solids) prior to disinfection in the chlorine contact chamber and discharge. Effluent leaving the treatment plant is measured by a flow meter located in the chlorine contact chamber adjacent to the outlet structure.

Findings

Discharge monitoring reports from the Omak STP show that flow into the treatment plant was designed for a flow of 0.99 mgd with no excessive infiltration-inflow (Omak STP Operation and Maintenance Manual). The strength of the wastewater entering the facility would be classified as weak (Metcalf and Eddy, 1972) (Table 1).

In August 1979 the sludge return crew pump malfunctioned and sludge from the secondary clarifier was returned to the plant by way of the lift station. Some sludge was also returned to the oxidation ditch via the waste sludge pump. Sludge was wasted to the aerobic holding tank on August 15 (47,689 gallons), and, because the sludge blanket in the clarifier was too high and solids were passing over the clarifier weirs, sludge was again wasted on August 22 (23,844 gallons) and August 31 (72,725 gallons). Despite wasting, sludge continued to pass over the clarifier weirs, enter the chlorine contact chamber and then was discharged to the Okanogan river. Throughout this period of sludge wasting (and drop in the concentration of mixed liquor in the oxidation ditch), the input of dissolved oxygen to the mixed liquor in the oxidation ditch was not reduced. The MLSS value in the ditch dropped to a value of 750 mg/l, while the dissolved oxygen concentration reached 6.0 mg/l in the ditch.

Despite the low MLSS value, sludge continued to pass over the clarifier weirs and this was due to both the screw pump being out of service and to over aeration of young sludge, causing nitrification and resulting in a rising sludge blanket in the secondary clarifier. The sludge return screw pump was placed back into service on Setpember 25 but the sludge blanket in the clarifier did not drop because of sludge age and over aeration. When the dissolved oxygen input to the oxidation ditch was reduced by lowering the level of the ditch, the sludge blanket in the clarifier and the MLSS concentration in the oxidation ditch increased.

The severe winter experienced in early 1979 caused a valve in the chlorine chamber to freeze and break. Since that time, only one chamber of the two chambered chlorine contact tank has been useable, and this has reduced plant efficiency by not allowing for periodic change overs to the other chamber and clean out of accumulated sludge that passed over the secondary clarifier weirs and entered the chlorine contact tank. This reduction in operating flexibility became very apparent when the sludge return screw pump went off line and sludge began passing over the weirs of the clarifier. Had both chambers of the chlorine contact chamber been serviceable, much of the sludge entering the chlorine contact chamber could have been prevented from being discharged to the Okanogan river by frequent change overs to the second chamber and clean out of the first chamber. When the broken valve is replaced, the unused chamber should be placed into service and the presently used chamber should be cleaned out, the sludge from which should be disposed of to the sludge drying beds or to the landfill.

Because of the broken screw pump and valve, this plant was not operating as well as expected, nor as well as it has been observed to be operating in the past. Because of the positive attitude and dedication of the operator, I expect that the plant will operate with a high level of waste strength reduction when the broken equipment is fixed.

Review of Laboratory Procedures and Techniques

Laboratory and sampling procedures were reviewed with Curley Wilson by Wes Maier on September 18, and samples collected by DOE were split and analyzed by Curley Wilson on September 19, these methods being observed and reviewed by Wes Maier.

Laboratory procedures and techniques were quite good however, a comparison of the analysis performed on the split samples showed some discrepancies (Table 2). The following will discuss possible reasons for those discrepencies.

Biochemical Oxygen Demand - 5 Day

BOD5 analysis is performed weekly on the municipal influent and unchlorinated effluent. Dechlorination and reseeding of the effluent is not performed nor is it required because of the use of unchlorinated effluent in the analysis. Purging of the samplers has been a problem in the past because of the distance from the sampler to the sample point, but this has been corrected by purging of the line for 24 hours prior to the initiation of the composite sampling cycle.

Distilled water used as a component of the dilution water is stored in the dark for approximately 7 days prior to use. However, the pH of the Omak distilled water was found to be 8.1 which is higher than it should be. The pH of this water should be adjusted to 7.2 prior to its use in the make-up of BOD dilution water. This may be one possible cause of the noted discrepancies.

Dilution water is prepared using Hach BOD Nutrient Buffer Pillows. The dissolved oxygen depletion in the blank varies from 0.0 mg/1 to 0.8 mg/1. Both Standard Methods for the Examination of Water and Wastewater, 14th Edition, 1975, and Laboratory Test Procedures for Biochemical Oxygen Demand of Water and Wastewater, Department of Ecology, August 1977, specify that the depletion of dissolved oxygen in the dilution water should not be more than 0.3 mg/1. Dissolved oxygen depletion values greater than 0.3 mg/1 usually indicate a problem with the analysis such as dirty glassware, reagents that do not meet specifications, or contaminated reagent water. None of these possible reasons for excessive dissolved oxygen depletion of reagent water were observed to exist at Omak. Perhaps the dissolved oxygen meter is producing incorrect values. Closer checks of dilution water dissolved oxygen depletion using the Winkler Titration Method may shed more light on these discrepancies.

A dissolved oxygen probe is used for all dissolved oxygen determinations. Although the Omak operator calibrates this probe daily, this calibration is done using a dissolved oxygen equivalent solution and not against the Winkler Titration method. The probe should be checked against the Winkler Titration method at least once per month and more frequently if time allows.

The operator was left a copy of Laboratory Test Procedure for Biochemical Oxygen Demand of Water and Wastewater, and the BOD method described in this publication was gone over with the operator. This method will be used for BOD analysis in the future.

In conclusion, recommendations were:

1. Use DOE approved method for BOD analysis
2. Check the pH of the distilled water used as a component of the dilution water and adjust to 7.2 if necessary.
3. Check glassware and reagents as possible sources of excessive dissolved oxygen depletion in the dilution water. Compare dissolved oxygen depletion using the Winkler Method and the dissolved oxygen probe.
4. Compare dissolved oxygen values obtained using a DO probe with those values obtained using the Winkler Method.

Total Suspended Solids

TSS analysis is performed weekly on the municipal influent and unchlorinated effluent. Sample and analysis technique are very good. The split effluent sample analyzed by the Omak operator compared very well with that analyzed by DOE (Table 2) however, such was not the case with the split influent sample results (Table 1). No explanation can be offered for this discrepancy.

It was found that Millipore Glass Fibre filters were being used rather than those recommended by DOE. When the current supply of these Millipore filters is exhausted, Omak will switch to one of the approved filters.

Fecal Coliform

Fecal coliform analysis is performed weekly on the chlorinated effluent and no discrepancies were noted in sample collection or analytical technique used.

Total Residual Chlorine

Total residual chlorine is performed daily. The method employed is the EPA and DOE approved DPD method.

HP:nd

TABLE 1

OMAK STP INFLUENT WASTEWATER CHARACTERISTICS

Parameter	Omak STP Influent September 18 - 19, 1979 DOE Analysis	Omak Analysis	Omak STP 1979 Average	Typical Domestic Sewage (Metcalf and Eddy, 1972) Strong	Medium	Weak
BOD	110 mg/l	141 mg/l	190 mg/l	300mg/l	200mg/l	100mg/l
Suspended Solids	72	136	157 mg/l	350	200	100
Tot. Org. Carbon				300	200	100
COD	240			1000	500	250
Total N.				85	40	20
NH_3-N	15			50	25	12
NO_2-N	<0.2			0	0	0
NO_3-N	<0.2			0	0	0
Tot. P	8			20	10	6
PO_4-P	5					
Tot. Solids	660			1200	700	350
Flow		0.556 mgd	0.63 mgd			
pH	7.3	7.2				

TABLE 2

OMAK STP EFFLUENT QUALITY

Parameter	Omak STP Effluents September 18 - 19, 1975 DOE Analysis	Omak Analysis	Omak STP 1979 Average	Permit Requirements
BOD	58 mg/1	38 mg/1	9 mg/1	30 mg/1
Susp. Solids	220 mg/1	212 mg/1	40 mg/1	30 mg/1
COD	240 mg/1			
NH_3-N	0.4 mg/1			
NO_2-N	0.2 mg/1			
NO_3-N	12 mg/1			
TOt. P	7.1 mg/1			
PO_4-P	5.7 mg/1			
Tot. Solids	800 mg/1			
Flow	.552 mgd	.556 mgd		
pH	7.4	7.5		6.5-8.5
Fecal coliform	94/100 ml			200/100 ml

State of Washington Department of Ecology

ORIGINAL TO: HP

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LAB FILES

OLYMPIA LABORATORY

DATA SUMMARY

Source: OMAK STP

Collected By: H. Porath

Date Collected: 9-18-79

Log Number:	79-3390	91	92	93
Station:	INF	EFF	CHLOR.? EFF. →	*
pH	7.3	7.4		
Turbidity (NTU)				
Sp. Conductivity (umhos/cm)	1130	925		
COD	240	240		
BOD (5 day)	110	58		
Total Coliform (Col./100ml)				
Fecal Coliform (Col./100ml)			96	92
NO3-N (Filtered)	<.2	12.		
NO2-N (Filtered)	<.2	0.2		
NH3-N (Unfiltered)	16.	0.4		
T. Kjeldahl-N (Unfiltered)				
O-PO4-P (Filtered)	5.0	5.7		
Total Phos.-P (Unfiltered)	8.0	7.1		
Total Solids	660	800		
Total Non. Vol. Solids	470	490		
Total Suspended Solids	72	220		
Total Sus. Non Vol. Solids	14	50		

[illegible] = .552

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Note: All results are in PPM (mg/L) unless otherwise specified. ND is 'None Detected'
"<" is "Less Than" and ">" is "Greater Than"

* NO TIME OR DATE

ECY 040-2-32

Summary By: [signature]   Date: 10-2-79

D.I. WATER P.H. AT OMAK STP WAS 8.1 WHEN B.O.D TEST SETUP. Should have been Adjusted To 7.2 prior To use. Possible CAUSE OF Result difference

9-19-79

Samples Collected 9-18-79
8:00 AM
9-19-79
8:00 AM

SUSPENDED SOLIDS

City of Omak

Influent PH 7.2

After 103° C. heating

Volume of sample	100	ml
Dry gross weight	94902	grams After 2 Hours Drying — 9.4900
Tare weight	9.4766	grams
Dry weight of sample	.0136	grams
	136	mg/l

Effluent PH 7.0

After 103° C. heating

Volume of sample	110	ml
Dry gross weight	7.7368	grams After 2 Hours Drying — 7.7365
Tare weight	7.7135	grams
Dry weight of sample	.0233	grams
	212	mg/l

________ % reduction

________ lbs. SS/day

City OMAK
Operator Wilson

BOD DATA SHEET AND CALCULATIONS

Day in [illegible] Time [illegible]
Day out Sept. 24 Time 10:45 am

Sample	Bottle Number	Sample Volume	0-Day D.O.	5-Day D.O.	Blank D.O. Depletion	D.O Depletion	Fx Seed Correction	Dil. Factor	B.O.D.	B.O.D Average
Dilution water	310	300	10.0							
Inc. Dil. water	1	300		- 9.3	- 0.7	=	x	x	=	
" " "	2	300		- 9.1	- 0.9	=	x	x	=	
Final eff	303	250	9.6							38
Final eff	14	250		- 1.0	- 8.6	= 1.0	x	x 4	= 4	~~18~~
Final eff	3	250		- 1.0	- 8.6	= 1.0	x	x 4	= 4	=
Final eff	15	167	9.7							43
Final eff	16	167		- 2.3	- 7.4	= 2.3	x	x 6	= 14.0	~~11~~
Final eff	17	167		- 1.2	- 8.5	= 1.2	x	x 6	= 7.2	
Raw	4	25	9.8							135
Raw	5	25		- 5.5	- 4.3	= 5.5	x	x 40	= 220	~~216~~
Raw	6	25		- 5.3	- 4.5	= 5.3	x	x 40	= 212	
Raw	11	20	9.7							148
Raw	9	20		- 6.5	- 3.2	= 6.5	x	x 50	= 325	~~315~~
Raw	7	20		- 6.1	- 3.6	= 6.1	x	x 50	= 305	
				-	-	=	x	x	=	=
				-	-	=	x	x	=	
				-	-	=	x	x	=	=
				-	-	=	x	x	=	
				-	-	=	x	x	=	=
				-	-	=	x	x	=	

Comp. sample using DOE sample

Effluent Turbid. Solids